

**REMARKS**

**Rejections under 35 USC §103(a)**

**Claims 1-3, 5, 6 and 9 are rejected under 35 USC §103(a) as being unpatentable over Shibata et al. (US 6,270,569) in view of Usui et al. (US 2002/0197825).**

Claim 1 has been amended to recite “preparing a eutectic alloy melt of gallium (Ga); dipping the seed crystal substrate into the eutectic alloy melt, the seed crystal substrate having a catalytic metal having a mesh, stripe, or open polka-dot pattern deposited thereon; and graphoepitaxially growing a single crystal film of the gallium-containing nitride at a temperature of 500°C to 900°C on the surface of the seed crystal substrate by the reaction at the surface of the seed crystal substrate between gallium, which is a component of a eutectic alloy, and nitrogen dissolving into the eutectic alloy melt from a space zone containing a nitrogen supply source above a surface of the melt.” This amendment is supported in the specification, especially at page 13, line 14.

Shibata et al describes at the cited portion as follows:

3000 g of Ga was charged in a quartz crucible 1 having an inner diameter of 70 mm and a height of 150 mm, and **the Ga was heated to 950°C.** by means of a heater 2, **thereby obtaining a Ga melt 3. Ammonia gas was injected into the Ga melt 3** via a gas introduction pipe 4 at a flow of 0.51/min for five hours. **The gas injected into the melt 3 reacted with the melt to thereby form GaN microcrystals. The GaN microcrystals floated to the surface of the Ga melt.** Ammonia gas which did not contribute to the reaction was released as bubbles, which passed through the melt 3, escaped to the space in the upper part of the vessel, and were exhausted to the outside of the vessel via an exhaust pipe 5. The exhausted ammonia gas was discharged to the atmosphere via wet type exhaust gas treatment equipment.

After the gas injection for five hours, the gas being injected was changed to nitrogen and the Ga melt was cooled to room temperature.

(Shibata et al, column 9, lines 20-37, emphasis added). According to Shibata et al, Ga is heated to obtain a Ga melt (not a **eutectic alloy** melt of Ga) and the gas injected into the melt 3 reacts with the melt to **form GaN microcrystals**. Here, Shibata et al discusses a method of making GaN microcrystals.

Shibata et al also describes at the other cited portion as follows:

**15 g of GaN powders synthesized by the injection method as a material 127 and 100 g of a metal Ga as a flux were charged into the crucible.** The GaN powders and the metal Ga were heated to 50°C. and mixed well in a state where the metal Ga melts so that the metal Ga covers the surface of each of the GaN powders.

The pressure in the furnace was increased to 20 MPa with a nitrogen gas by operating a valve 126. While maintaining the pressure, the material 127 was increased to 1600°C. **The material 127 was held at 1600°C. for three hours, the GaN powders were dissolved in the Ga flux,** the material temperature was decreased to 800°C. at a ratio of 1°C./min, and after that, the material was quenched, and the pressure was returned to atmospheric pressure.

When the sapphire substrate serving as the seed crystal 128, which was subjected to the above growth processes, was taken out from the furnace and the adhered Ga was cleaned by hydrochloric acid, a GaN single crystal having a thickness of about 1.3 mm was grown on the sapphire substrate.

(Shibata et al, column 18 line 9-30, emphasis added). Thus, according to this embodiment of Shibata et al, GaN powders as a material and a metal Ga as a flux were charged into the crucible, and the GaN powders were dissolved in the Ga flux. Then the material temperature is slowly decreased to 800°C., and after that, the material is quenched. Thus, GaN is grown on the

sapphire substrate serving as the seed crystal. The embodiment 16, which is disclosed at column 18 lines 30-50, also uses GaN powders as a material and a metal Ga as a flux.

In Shibata et al, a **eutectic alloy melt of gallium (Ga)** is not used. Also, nothing in Shibata indicates that the seed crystal substrate has a **catalytic metal having a mesh, stripe, or open polka-dot pattern** or that the seed crystal substrate includes a crystal layer composed of a nitride including at least one selected from the group of gallium (Ga), aluminum (Al), and indium (In). Moreover, Shibata et al does not **graphoepitaxially grow** a single crystal film of the gallium-containing nitride on the surface of the seed crystal substrate.

Usui et al has been cited for allegedly disclosing adding to the substrate catalyst such as Pt and Ir. Even regarding the catalytic metal, Usui et al does not teach or suggest that the seed crystal substrate has a catalytic metal **having a mesh, stripe, or open polka-dot pattern**.

Therefore, the combination of Shibata et al and Usui et al does not teach or suggest “preparing a eutectic alloy melt of gallium (Ga); dipping the seed crystal substrate into the eutectic alloy melt, the seed crystal substrate having a catalytic metal having a mesh, stripe, or open polka-dot pattern deposited thereon; and graphoepitaxially growing a single crystal film of the gallium-containing nitride at a temperature of 500°C to 900°C on the surface of the seed crystal substrate by the reaction at the surface of the seed crystal substrate between gallium, which is a component of a eutectic alloy, and nitrogen dissolving into the eutectic alloy melt from a space zone containing a nitrogen supply source above a surface of the melt,” as recited in claim 1

For at least these reasons, claim 1 patentably distinguishes over Shibata et al and Usui et al. Claims 2, 3, 5, 6 and 9, depending from claim 1, also patentably distinguishes over Shibata et al and Usui et al for at least the same reasons.

**Claims 4, 8 and 10-12 are rejected under 35 USC §103(a) as being unpatentable over Shibata et al. (US 6,270,569) in view of Usui et al. (US 2002/0197825) and in further view of Kitaoka et al. (US 2004/0144300).**

Claims 4, 8 and 10-12, all depend from claim 1, which patentably distinguish over Shibata et al and Usui et al.

Kitaoka et al is cited for allegedly disclosing a nitrogen gas atmosphere of between 1 to 50 atm, or 0.10 to 5.07 MPa. Such disclosure of Kitaoka et al, however, does not remedy the deficiencies of Shibata et al and Usui et al discussed above.

For at least these reasons, claims 4, 8 and 10-12 patentably distinguish over Shibata et al, Usui et al and Kitaoka et al.

In view of the aforementioned amendments and accompanying remarks, Applicants submit that the claims, as herein amended, are in condition for allowance. Applicants request such action at an early date.

Supplemental Amendment  
Application No. 10/586,581  
Attorney Docket No. 062697

If the Examiner believes that this application is not now in condition for allowance, the Examiner is requested to contact Applicants' undersigned attorney to arrange for an interview to expedite the disposition of this case.

If this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. The fees for such an extension or any other fees that may be due with respect to this paper may be charged to Deposit Account No. 50-2866.

Respectfully submitted,

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A handwritten signature in black ink, appearing to read "Sadao Kinashi", written in a cursive style.

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